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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,859	01/19/2002	Kenneth E. Goodson	081013/0269268	5409

7590 07/28/2004

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EXAMINER

MCKINNON, TERRELL L

ART UNIT	PAPER NUMBER
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3743

DATE MAILED: 07/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/053,859	<b>Applicant(s)</b> GOODSON ET AL.	
	<b>Examiner</b> Terrell L Mckinnon	<b>Art Unit</b> 3743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 January 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-114 is/are pending in the application.
- 4a) Of the above claim(s) 69-84 and 102-110 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 85-89 is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-20, 2225, 30--37, 39-44, 46-48, 50-57, 59-61 and 63-114 is/are rejected.
- 7) ☒ Claim(s) 11, 21, 26-29, 38, 43, 45, 49 and 58 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>1</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Applicant's election without traverse of Group I and claims I - 68, 85 - 101, and 111-114 filed June 17, 2004 is acknowledged. Claim 69-84 and 102-110 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b) as being drawn to a non-elected invention.

Election was made without traverse filed June 17, 2004.

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 90 and 101 are rejected under 35 U.S.C. 102(b) as being anticipated by Vafai et al. (U.S. 6,457,515).

Vafai discloses a micro-channel cooling system comprising all of the applicant's claimed and disclosed limitations of the instant invention.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-10, 22-25, 30-37, 39-42, 44, 46-48, 50-57, 62, 67, 68, 91 and 111-114 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vafai et al. (U.S. 6,457,515) in view of Arana et al. (U.S. 2003/0027022).

Vafai's invention discloses all of the claimed limitations from above except for an electroosmotic pump disposed between the heat exchanger and the substrate; temperature sensor disposed in proximity of the parallel subchannels; a temperature control circuit; a pressure sensor disposed in the substrate; another pressure sensor disposed in fluid path between the substrate and the heat exchanger; a roughen partial blocking structure in the microchannel wall to increase surface area contacting the fluid; the substrate includes opening for interaction of pressure, sound or light.

5. However, Arana teaches the use of a thermally efficient micro-channel device comprising using the device has a heat exchanger for transferring heat in conjunction with an electroosmotic pump (see [0003]; [0033]; [0055]); the multi-layered substrate being fabricated from a plurality of materials bonded together (see [0044]; [0059]; [0075-0076]; [0081]; and the use of temperature sensors, flow sensors and feedback controls within the micro-channel (see [0037]; (page 4, column 2, lines3-6); and [0059]

Given the teachings of Arana, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the layered micro-channel heat sink of Vafai with use of an electroosmotic pump disposed between the heat exchanger and the substrate; temperature sensor disposed in proximity of the parallel subchannels; a temperature control circuit; a pressure sensor disposed in the substrate; another

pressure sensor disposed in fluid path between the substrate and the heat exchanger; a roughen partial blocking structure in the microchannel wall to increase surface area contacting the fluid; and the substrate includes opening for interaction of pressure, sound or light.

Doing so would provide an improved and more efficient micro-channel cooling device.

6. Claims 12-18, 20, 59-66, 92-100 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vafai et al. (U.S. 6,457,515) in view of Arana et al. (U.S. 2003/0027022) as applied to claims above, and further in view of Burdon et al. (U.S. 6,572,830).

Vafai's invention, as modified by Arana, discloses all of the claimed limitations from above except for the use of a plurality of vertical electrical connection; vertical and horizontal fluid channels; and opening through which another interaction is capable of impinging upon the heat emitting device.

7. However, Burdon teaches an integrated multi-layered micro-fluidic cooling device comprising the use of a plurality of vertical electrical connection; vertical and horizontal fluid channels; and opening through which another interaction is capable of impinging upon the heat emitting device (see abstract).

Given the teachings of Burdon, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the layered micro-channel heat sink of Vafai with the use of a plurality of vertical electrical connection; vertical and

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horizontal fluid channels; and opening through which another interaction is capable of impinging upon the heat emitting device.

Doing so would furthermore improve the cooling performance by providing an alternate means of arranging fluid channels and provide electrical connections for other circuits.

### ***Allowable Subject Matter***

8. Claims 85-89 are allowed.
9. Claims 11, 21, 26-29, 38, 43, 45, 49 and 58 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

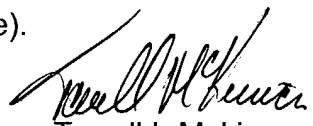
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are cited for disclosing related limitations of the applicant's claimed and disclosed invention. Chu et al, Hamilton et al, Chrysler et al, Batchelder, Kelly et al, Blackburn, Kamholz, Liu et al, Zuo, Insley et al, Little and Mundinger et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Terrell L Mckinnon whose telephone number is 703-305-0059. The examiner can normally be reached on Monday -Thursday and every other Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennett can be reached on 308-0101. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Terrell L Mckinnon  
Primary Examiner  
Art Unit 3743  
July 26, 2004